REMARKS

In the Office Action mailed May 9, 2005, claims 1-4 and 9-23 are pending. Claims 5-8 are subject to a restriction requirement and have been withdrawn but Applicants reserve the right to pursue the subject matter of claims 5-8 in a divisional application.

Claims 1, 9, and 19 are the sole independent claims. Claims 3, 9 and 14 are objected to because of various alleged informalities. Claims 1-4 stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Faruqi et al. (WO 97/02563) ("Faruqi '563"). Claims 9-10, 12-13, 15, and 17-18 also stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Faruqi '563. Claim 14 stands rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Faruqi '563 in view of Henshaw et al. (U.S. Patent No. 5,319,629). Claims 19-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Faruqi '563 in view of Steenblik et al. (U.S. Patent No. 5,75,316). Claims 11 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

After a careful review of the Office Action and the cited references, Applicant's respectively request favorable reconsideration in view of the following clarifications and remarks.

I. CLAIM OBJECTIONS

Claims 1, 9, and 19 are the sole independent claims. Claims 3, 9 and 14 are objected to because of various alleged informalities. Corrections have been made to claims 9 and 14 to overcome these formalities.

With respect to currently pending claim 3, the Office Action objects to this claim stating in part that Applicants' Specification does not contain the term "on axis hologram." (May 9,

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2005 Office Action at page 2). Applicants respectively traverse. The Examiner is directed to various portions of Applicants' presently pending specification, including at least page 6 lines 14-18; page 12 lines 12-17; page 15 lines 1 – 13; page 17 lines 22-30; page 20 lines 1 – 15; and page 23 lines 1 -4.

II. CLAIM REJECTIONS UNDER 35 U.S.C. § § 102(e) AND 103

Claims 1-4 stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Faruqi et al. (WO 97/02563) ("Faruqi ''563"). Claims 9-10, 12-13, 15, and 17-18 also stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Faruqi ''563. Claim 14 stands rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Faruqi '563 in view of Henshaw '629 and claims 19-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Faruqi '563 in view of Steenblik '316. Applicants respectively traverse.

A. Applicants' Presently Claimed Invention

Applicants' presently claimed invention generally relates to a holographic recording process utilizing plarisation holography. For example, and as Applicants explain, the holographic recording process utilised in the invention is the so-called polarisation holography. Polarisation holographic recording is accomplished by two plane waves having mutually orthogonal polarisation. In this type of recording the resulting light field is not modulated by intensity but only by polarisation. The induced optical anisotropy (dichroism or birefringence) is spatially modulated in accordance with the polarisation modulation of the recording light field, i.e., a polarisation holographic grating is recorded. The various possibilities for recording polarisation holographic gratings are known. It has also been shown that the diffraction efficiency (η) depends on the type of polarisation interference pattern, which forms the basis of the polarisation multiplexing. This is based on the fact that at sufficiently large values of

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photoinduced anisotropy it is feasible to record polarisation gratings with high efficiency, up to 25% for amplitude modulation and up to 100% for phase modulation. When the recording is accomplished with two orthogonal circularly polarised waves, η is strongly dependent on the ellipticity of the reconstructing wave. By varying the ellipticity, η can vary from 0 to its maximum value. If the object and reference waves have parallel polarisations an ordinary intensity interference pattern results, i.e., the light field intensity is sinusoidally modulated. When the two waves have mutually orthogonal polarisations, the intensity of the resultant light field is constant and only its polarisation is periodically spatially modulated in accordance with the change of the phase shift between them producing a polarisation interference pattern. Both interference effects may be recorded with suitable materials. In the embodiments of the apparatus shown in Figs. 2 and 3, it is contemplated to utilise both effects. In the preferred version the object SLM 25 provides intensity modulation, but the reference beam 16 and the object beam 15 are also orthogonally polarised, to improve the readout SNR. Applicants' Specification at page 15 lines 1 – 26.

Applicants' presently pending independent claims are directed to such a recording process. For example, Independent Claim 1 expressly recites:

> Method for the recording and reading of data on a recording medium, using a holographic medium with a thin holographic recording layer, preferably and optical card, and holographic write/read apparatus for the recording medium, wherein the recording of the information is in the form of data pages stored as thin Fourier holograms, characterized by using reflected transmission and polarisation holography with different write and read wavelength, and during reading correcting the distortion in the readout channel caused by the difference between the write and read
> wavelengths.

(emphasis added).

Independent Claims 9 and 19 include similar limitations. For example, Independent

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Claim 9 expressly recites "write optics comprising a polarised writing light source (20), polarising selector means (23) for separating and/or combining a reference beam and an object beam, object beam modulating means (25), polarisation wave plate (24,35), an objective lens (27,47) for imaging the object beam onto a recording layer, and further the read optics comprising a polarised reading light source (21), and a polarising selector (23') and/or spatial filtering means for separating and/or combining the reference beam and an image beam."

And Independent Claim 19 expressly recites "information is recorded in the form several discrete holograms (61) and/or subholograms recorded in different physical and/or logical recording locations on the optical recording medium (2), the holograms (61) containing data sets, where the sequence of the data sets together constitute the recorded information, characterised in that the data sets are recorded in a random sequence of the recording locations."

B. Faruqi '563 Does Not Teach or Suggest Applicants Presently Claimed Invention

Faruqi '563 does not teach or suggest Applicants' presently claimed invention. As an initial matter, Applicants have identified certain differences and limitations of the optical storage system taught and suggested by Faruqi '563 and these were noted in Applicants' Specification. For example, at page 3 line 18 – page 4 line 2 Applicants explained:

> The document WO-A-97/02563 ["Faruqi '563"] discloses an optical system for holographic recording. This known system also includes lasers with a different read and write wavelength. The suggested data storage medium is a card with a thick (50□m) holographic storage layer. Different forms of holography are suggested, but polarisation holography is not mentioned. The write and read optics contain waveguide structures in combination with detector cells to read out the data, instead of traditional optical systems. The optical head detects the intensity modulation caused by the recorded holograms directly, and there is no imaging system between the storage medium and the optical head. Therefore, the problem of wavelength distortion is not addressed either. On the other hand, the disclosed complex waveguide head comprises expensive acousto-optical elements and other electro-optical devices which require very sophisticated control and power supply systems. This optical head can not be manufactured in a cost-effective way with current technology.

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Therefore, one fundamental distinction between Applicants' presently claimed invention and Faruqi '563 relates to the type of recording used. For example, Applicants' Claim 1 is generally directed to the use of polarization holography. Polarization holography is fundamentally different from the type of recording taught and suggested in Faruqi '563, i.e., polarization multiplexing. In polarization holography, the two beams overlapping to make a hologram have orthogonal polarizations, such as orthogonal circular polarization. The storage medium therefore has to be polarization sensitive. This is different from Faruqi '563 which expressly teaches that:

> The usual holographic recording process involves the interference of two coherent, parallel polarisation light beams on an appropriate photosensitive material (photopolymerisable/photocrosslinkable) . . . The variation in intensity in the resulting interference pattern causes the complex index of refraction to be modulated throughout the volume of the medium.

Faruqi '563 at page 3 line 31 – page 4 line 5.

In Applicants' presently claimed invention, the materials are neither photopolymerisable nor photocrosslinkable. In Applicants' presently claimed invention, the intensity does not vary and the index of refraction is modulated through a reorientation of the molecules on irradiation with polarized light.

In addition, even though the laser is inherently a polarized source, the method taught in Faruqi '563 utilizes interference of two coherent, parallel polarizations. In contrast, Applicants' presently claimed invention utilizes two beams that have orthogonal polarization and the polarization of the object beam is not modulated. Rather, the object beam passes through a two dimensional bit-map and gets intensity modulated.

Another important difference between Applicants' presently claimed invention and

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Faruqi '563 lies in the thickness of the recording medium used. For example, Applicants' presently pending Independent Claim 1 is expressly directed to the use of a thin recording medium with a thickness between 250-1000 nm. For example, Applicants explain that according to the invention, for the method it is suggested to use a holographic recording medium, such as a memory card having a carrier substrate, a holographic recording layer sensitive to light, and a reflection layer between the carrier substrate and the recording layer. In the recording medium of the invention the recording layer is a polarisation sensitive polymer material, and the thickness of the recording layer is 0.5-2 times the wavelength of the reading and/or recording light. As the wavelength for recording is 500 nm, the thickness of the film according to the above will be 250-1000 nm. Applicants' Specification at page 5 lines 13 – 18.

The May 9, 2005 Office Action appears to contend that that such a thin recoding medium is described in Faruqi '563. Applicants respectively traverse. As Faruqi '563 explains, the Faruqi '563 optical storage system concerns the use of a recording medium with a thickness of typically 50 μm. According to Faruqi '563, "The storage medium is typically 50 μm thick and able to store multiple diffraction patterns at varying depths." Faruqi '563 page 16, lines 25-26.

Yet another important distinction between Applicants' presently claimed invention and Faruqi '563 lies in the part of the invention, which relates to the recording methods used. For example, currently pending Independent Claim 1 expressly recites that the recording of the information is in the form of data pages stored as Fourier holograms.

In contrast, Faruqi '563 does not record Fourier holograms of two-dimensional objects. Rather, Faruqi '563 appears to record single bits as holograms. In contrast, the objects in Applicants' presently claimed invention are two-dimensional bit-maps presented on the Liquid Crystalline Spatial Light Modulator (LCSLM).

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Another difference between Applicants' presently claimed invention and Faruqi '563 is that in Applicants' presently claimed invention the data storage capacity of the optical storage card can be increased by recording data in multiple layers. In contrast, and as described above, Faruqi '563 teaches recording data in only a single layer. Applicants' Specification at page 3, lines 23-36.

To anticipate a claim, "each and every element set forth in the claim [must be] found, either expressly or inherently described, in a single . . . reference." *Vergall Bros. V. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987) (M.P.E.P. Section 2131). Consequently, since Faruqi '563 fails to disclose a an optical storage system that utilizes "polarization holography," Faruqi '563 simply fails to disclose an optical storage system that "polarization holography with different write and read wavelengths" as expressly recited in Independent Claim 1. Faruqi '563 therefore does not to teach every element of the claimed invention and, therefore does not anticipate Independent Claims 1, 9, and 19. The remaining claims are all dependent on these allowable independent claims and are therefore allowable for at least the reasons stated above.

V. SUMMARY

In view of the amendments and remarks above, the Applicant respectfully submits that the present application is in condition for allowance and solicits action to that end. If there are any additional matters that may be resolved or clarified through a telephone interview, the Examiner is respectfully requested to contact Applicant's undersigned representative.

Respectfully Submitted,

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